



# Real world applications of discrete mathematics

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## Abstract

Discrete mathematics is an important branch of applied mathematics and graph theory is an important part of discrete mathematics. It have lot of applications in modern society. Graph colouring or graph labeling is an important branch of graph theory which can easily solve many real life problems. In this article, we have shown some direct applications of discrete mathematics, like applications of graph theory to scheduling problems, coloring of map in GSM mobile phone networks, google maps or GPS, traffic signal lights, Social networks, aircraft scheduling, etc.

## Keywords

colouring, scheduling problem, interval graph.

## AMS Subject Classification

05C85, 68R10.

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## 1. Introduction

Mathematics is classified into two branches, *Applied Mathematics* and *Pure Mathematics*. *Discrete Mathematics* is an essential branch of *Applied Mathematics* and *Graph Theory* is a crucial topic in the field of *Discrete Mathematics*. Graphs are significant since the graph is the only way of revealing information in pictorial form. A graph display information which is equivalent to many words. Computer science applications highly utilize graph-theoretical notions. Some well known graph theoretic problems are: Shortest path problem, job sequencing problem, conditional covering problem, traveling salesman problem, graph colouring problem, etc.

Graph Colouring is a significant problem in graph theory. This problem is widely used to solve many real problems, viz:

scheduling, resource allocation, traffic phasing, task assignment, etc [1, 2, 13].  $L(k_1, k_2, \dots, k_n)$ -labeling of the graph is the generalization of Graph Colouring problem and it has also widely applied to solve frequency assignment problem in wireless communication [3–12].

In this article, some applications of graph colouring have been studied. An introduction is given in section 1, some basic terms related to graph theory are provided in section 2. Graph colouring and extension of graph colouring are provided in section 3. Then, in section 4, some important graph theory applications and graph colouring to solve real life problems are presented. Finally in section 5, a brief conclusions has presented.

## 2. Basic Concept in Graph Theory

Earlier, we may realize the graph's application, so we must know graph theory related some definition. The author of this paper defined some terms related to graph theory most readily.

**Definition 2.1.** A graph usually denoted by  $G = (V, E)$  and consists of the set of vertices (nodes)  $V$  together with a set of edges  $E$ . The number of vertices in a graph is generally denoted by  $n$  while the number of edges is denoted by  $m$ .

**Example:** Let there be direct flights between the countries, India( $i$ ) and America( $a$ ); India( $i$ ) and China( $c$ ); America( $a$ )

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